National Institute of Environmental Health Sciences

The impact of climate change on ozone-related mortality in Sydney

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Abstract:

Coupled global, regional and chemical transport models are now being used with relative-risk functions to determine the impact of climate change on human health. Studies have been carried out for global and regional scales, and in our paper we examine the impact of climate change on ozone-related mortality at the local scale across an urban metropolis (Sydney, Australia). Using three coupled models, with a grid spacing of 3 km for the chemical transport model (CTM), and a mortality relative risk function of 1.0006 per 1 ppb increase in daily maximum 1-hour ozone concentration, we evaluated the change in ozone concentrations and mortality between decades 1996-2005 and 2051-2060. The global model was run with the A2 emissions scenario. As there is currently uncertainty regarding a threshold concentration below which ozone does not impact on mortality, we calculated mortality estimates for the three daily maximum 1-hr ozone concentration thresholds of 0, 25 and 40 ppb. The mortality increase for 2051-2060 ranges from 2.3% for a 0 ppb threshold to 27.3% for a 40 ppb threshold, although the numerical increases differ little. Our modeling approach is able to identify the variation in ozone-related mortality changes at a suburban scale, estimating that climate change could lead to an additional 55 to 65 deaths across Sydney in the decade 2051-2060. Interestingly, the largest increases do not correspond spatially to the largest ozone increases or the densest population centres. The distribution pattern of changes does not seem to vary with threshold value, while the magnitude only varies slightly.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES)

Special Report on Emissions Scenarios (SRES) Scenario: SRES A2

Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Temperature

Air Pollution: Ozone

Temperature: Fluctuations

Geographic Feature: ☑

resource focuses on specific type of geography

Urban

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Australasia

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Morbidity/Mortality

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction, Methodology, Outcome Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article

Socioeconomic Scenario: SES scenarios

Timescale: ☑

time period studied

Long-Term (>50 years)